

## AESTIVATION OF ADULT WINTER GNATS (DIPTERA: TRICHO CERIDAE)

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### Introduction

As their common name implies, northern hemisphere members of the Trichoceridae are most commonly seen during winter when they appear in swarms on sunny days (Imms 1973). This characteristic has also been noted for southern hemisphere species. Alexander (1926) records them for late autumn, early spring and mild sunny days in winter while Colless and McAlpine (1991) describe their distribution as the cooler areas of south-eastern Australia in the colder months of the year.

The larvae occur principally in decomposing vegetable matter including rotting mushrooms (Colless and McAlpine 1991). Winter emergence would appear to be a strategy for avoiding high temperatures and consequent desiccation and, possibly, increasing the likelihood of a larval food source being present. Two different life cycles can be postulated involving a summer diapause as either egg or pupa: (1) eggs laid in late winter; larvae present in spring; summer diapause as pupa; adult emergence in autumn; (2) eggs, laid in spring, are in diapause during summer; larvae present during autumn with a short pupal stage in early winter.

Australian published observations are inadequate to test these hypotheses. This note proposes a third explanation: summer aestivation by adults.

### Locality

Fourth Hill, Warrandyte was part of the first proclaimed goldfield in Victoria. From the late 1850's mines and tunnels were dug to extract reef quartz and two of these are still accessible to the public. Johnston's Mine and Geraghty's Mine are horizontal drives over 100 m in length. Details are given in the Warrandyte State Park Management Plan (Anon. 1990) together with descriptions of flora, fauna and geology.

### Observations

On 3.xi.1981 many winter gnats were found at the rear of Johnston's mine hanging from the walls and ceiling. They were not torpid but responded to touch and seemed to react slightly to torchlight. On 5 December, after dark, winter gnats were found in the same part of the mine. On 4.iv.82 very few winter gnats were present at the rear of Johnston's mine. The main aggregations were near the entrance where they were found in crevices and in shaded areas behind overhangs. Approximately ten years later, on 27.i.92, numerous winter gnats were found hanging from the walls and ceiling at the rear of Johnston's mine. On 2.viii.1982 there were no gnats found in any part of that mine.

On 30.xii.1981 winter gnats were sparsely distributed in Geraghty's mine and on 27.i.1992 they were found randomly scattered along the walls of a cross-drive.

### Systematics

The presence of ocelli and a strongly curved anal vein readily identifies these flies as being in the family Trichoceridae (Colless and McAlpine 1991) and from Alexander's (1926) key they can be placed in the genus *Nothotrichocera* Alexander. However, their other characteristics are intermediate or inconsistent with the species in the key. They match an undescribed species in the Museum of Victoria that was caught in 1928 and given a manuscript name, probably by C.P. Alexander (K. Walker *pers. comm.*). D. Colless (*pers. comm.*) confirmed that ANIC also holds a conspecific specimen determined by Alexander.

### Discussion

Summer aestivation is well documented in adult Australian Lepidoptera (Common 1954; Edwards 1973) as a strategy to produce larvae when food plants are available and to minimise the effects of high temperatures and desiccation. Flies of the family Perissommatidae are active in winter. Their larvae are well adapted to both a semi-liquid rotting medium and to aestivation during summer drought (Colless and McAlpine 1991).

Within Australia, a country noted for its aridity (Heatwole 1987), a number of taxa have adult summer aestivation rather than diapause of egg or pupa. In the case of the winter gnats, perhaps this allows a rapid deployment when favourable conditions return, rather than relying on a mechanism to break diapause and then completing the life cycle.

The behaviour of the specimens in Victoria contrasts with the British species *Trichocera maculipennis* Meigen which Hutson (1978) categorises as a troglophile; species which are notably regular in caves at all times of the year but have no special adaptations for that environment.

Further careful observations are required to document the full life cycle of this fly. Of particular importance is the location of the larval food source with respect to the tunnel entrances and the vagility of the adults. For at least ten years, and probably for many more generations, adult insects have been finding their way into the same tunnels to avoid the heat of summer. The cues which trigger egress and ingress are unknown.

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